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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/988,651
Filing Date: November 20, 2001
Appellant(s): LARKIN ET AL.

Jay M. Cantor
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on May 24, 2007 appealing from the Office action mailed March 6, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is partially correct.

Appellants' statement that claims 12-29 are rejected is correct.

Appellants state that claims 15-19 and 24 to 28 *were previously* indicated allowable. However, that statement of allowability was rescinded during prosecution. (See non-final Office Action mailed 3/06/07, paragraph 2.)

For the purposes of the present appeal, all of claims 12-29 stand rejected.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is **generally correct**. The **amended claims** do recite that the hydrogen treatment of the semiconductor device is carried out until hydrogen "**substantially saturates** the semiconductor device." However, the invention **as originally disclosed** is narrower: the specification requires that the hydrogen treatment be carried out until hydrogen "**completely saturates** the semiconductor device." (See the present specification at page 5, lines 10-11; page 7, lines 26-27; and page 9, lines 10-11.) Neither the specification nor the originally-filed claims ever disclosed

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the broader subject matter of *substantially* saturating the device with hydrogen. This difference is at the heart of all of the issues presently on appeal:

- 1) Is the newly-added limitation, "substantially saturates," broader than the originally-filed specification's disclosure of "completely saturates"? Restated, does this amendment raise the issue of new matter?
- 2) Is the term "substantially saturated" indefinite over 35 U.S.C. 112, second paragraph?
- 3) Was the rejection under 35 U.S.C. 102(b) over Ino et al. proper?
- 4) Was the rejection under 35 U.S.C. 102(b) over Mora proper?
- 5) Was the rejection under 35 U.S.C. 102(e) over Chen et al. proper?
- 6) Was the rejection under 35 U.S.C. 103(a) over Chen et al. proper?

Every issue on appeal relates to whether the term "substantially saturates" is broader than the term "completely saturates." Appellants contend that the terms are synonymous while the examiner's position is that the term "substantially saturates" is broader than the term "saturates."

(6) Grounds of Rejection to be Reviewed on Appeal

The Appellants' statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

Claims 12-29 (not 21-29) are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The non-final Office Action dated 3/06/07 included a clerical error in the heading, incorrectly reciting claims "21-29" instead of claims "12-29). However, it is reasonably apparent that the heading's recitation of "21" was a typographical juxtaposition of the digits of claim 12: the body of the 112-1st paragraph rejection itself expressly states, "[t]he limitation "substantially saturates" in **line 7 of independent claim 12**, and line 6 of independent claim 21 constitute[s] new matter." (Office Action dated 3/06/07, paragraph 5, emphasis added)

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,888,839	Ino et al.	3-1999
4,920,077	Mora	4-1990
5,866,945	Chen et al.	2-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 12 – 29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had

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possession of the claimed invention. The limitation "substantially saturates" in line 7 of independent claim 12 and line 6 of independent claim 21 constitute new matter.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 12 – 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. The term "substantially saturates" in claims 12 and 21 is a relative term, which renders the claim indefinite. The term "substantially saturates" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Dependent claims 13 – 20 and 22 – 29 are also rendered indefinite.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of

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the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 12 – 14, 20, 21 – 23, and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Ino et al. (US Patent 5888839).

Ino et al teach a semiconductor device (figs. 7), comprising:

a semiconductor device having at least one metal layer (47, 49) completed;

a planarizing dielectric layer (48, 50) on top of the semiconductor device; and

wherein the semiconductor has diffused hydrogen (fig. 7O element 42, col. 10 lines 16 – 20).

The process limitations have been given patentable weight in accordance with the well-established product-by-process doctrine. The presence of process limitations on a product claim, which product does not otherwise patentably distinguish over prior art, cannot impart patentability to the product. In re Stephens 145 USPQ 656 (CCPA).

Subsequent diffusion does not require the Final Product to be completely or substantially saturated. Claim 12 recites the limitation of “providing a hydrogen treatment until hydrogen diffuses throughout and substantially saturates the semiconductor device.” This language is directed towards the method of making the device, but does not necessarily limit the final structure. The final product does not necessarily have to be saturated with hydrogen or even substantially saturated, because hydrogen diffuses out of semiconductor device over time.

8. Claims 21 – 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Mora (US Patent 4920077).

Mora teaches a semiconductor device, comprising:

a semiconductor device having one metal layer completed (col. 4 lines 22 – 47);
a hydrogen treated semiconductor device (col. 4 lines 48 – 54); and
wherein the semiconductor device has diffused hydrogen (col. 4 lines 48 – 54).

9. Claims 12 – 14, 19 – 23, 28 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al. (US Patent 5866945).

Chen et al teach a semiconductor device (fig. 5), comprising:

a semiconductor device having at least one metal layer (51) completed;
a planarizing dielectric layer comprising HSQ film (52), TEOS film (53) and a dielectric film (54) on top of the semiconductor device; and

wherein the semiconductor has 87% - 90% Si-H bonds from plasma diffused hydrogen (col. 5 line 11 – 30) & col. 6 lines 60 – col. 7 lines 29).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the

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applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 15 – 18 and 24 - 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (5866945).

Chen et al. teach the features previously outlined, but lack the order in which the HSQ and TEOS are arranged in the dielectric stack.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to rearrange the order of the dielectric for production optimization.

Rearranging parts of an invention involves routine skill in the art. In re Japikse USPQ 70.

(10) Response to Arguments

The rejection of claims 12 to 29 under 35 U.S.C 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s) at the time of the application was filed, had possession of the claimed invention.

Appellants' originally-filed specification explicitly and repeatedly stated that their invention for decreasing channel hot carrier (CHC) degradation entailed subjecting the semiconductor device to a hydrogen treatment "until hydrogen **completely saturates** the semiconductor device." (emphasis added; see the present specification at page 5, lines 10-11; page 7, lines 26-27; and page 9, lines 10-11.) Neither the specification nor the originally-filed claims ever disclosed the broader subject matter of **substantially saturating** the device with hydrogen. This broader language was first added to the claims in the amendment filed 1/30/06, more than four years after the filing of the present application and about 7½ years after the provisional application priority date of 8/13/98. Appellants'

specification simply does not convey that appellants envisioned, at the time of filing, decreasing CHC degradation by only **substantially** saturating the device with hydrogen without **completely** saturating it.

Appellants contend that the new matter rejection under 35 U.S.C. 112, first paragraph, is improper because the difference between the terms “substantially saturate” and “completely saturate” is “inconsequential.” Appellants rely on the case of *Standard Oil v. Montedison*, 206 USPQ 676 (D. Delaware 1980) for the proposition that the difference between the terms “substantially saturates” and “saturates” are inconsequential. Appellants’ misinterpret the *Standard Oil*, and the reliance on this case is misplaced. *Standard Oil* does not stand for the proposition that inconsequential differences are sufficiently synonymous to satisfy 112-1st requirements. In fact, *Standard Oil* supports the examiner’s position that “substantially saturates” is broader than “completely saturates.”

The court in *Standard Oil* was addressing the issue of whether the language of claims amended to invoke an interference found sufficient support in the specification. While the *Standard Oil* court held that “the description requirement... does not mandate *in haec verba* repetition of the formation language of the [interference] Count,” *Id.* at 714, “the application [must] describe the product in language that is legally equivalent to that of the Count.” *Id.* Then based upon data contained within Standard’s disclosure, which evidenced that a crystalline structure was in fact disclosed, the court further held that Standard’s specification provided support for their use of the term “crystalline.” *Id.*

In the present appeal, the specification provides no mention of the term “substantially saturates,” let alone any mention of how “substantially saturated” relates to

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"completely saturated." Thus the present appeal is differentiated from the *Standard Oil* case in which the claimed subject matter at issue was supported by the specification.

Moreover, the *Standard Oil* court also held that "substantial crystallinity" as used in that context only excluded "solid polypropylenes containing no more than an inconsequential amount of crystalline polypropylene." *Id.* at 688 and 714. Restated, "substantial crystallinity" included any and all levels of crystallinity less than "complete crystallinity" except for essentially amorphous compounds (i.e., "substantially" reads on anything more than nothing). As such, contrary to the present appellants' assertions that "substantially limits the scope to "essentially all", the *Standard Oil* court found that "substantial crystallinity" was much broader than "complete crystallinity."

The present appeal is also distinguishable from *Standard Oil* in another aspect. It is quite common for a party copying claims to invoke an interference to use language that is not *in haec verba*, or literally disclosed, in the specification. The present appellants, however, are not involved in an interference. As such, they are free to use their own language that expressly appears in the specification. Restated, if appellants meant for "substantially saturates" to mean "completely saturates," they had the option of using "completely saturates." The only reason to opt for "substantially saturates" is that they are attempting to get broader coverage than would be afforded by the term "completely saturates." In fact, Appellants admit this in their appeal brief:

... The intent [of the present invention] is to totally saturate the device with hydrogen. However, it is possible and probably likely to [sic: too that] a very small and insignificant number of sites may be unsaturated without in any way altering the invention herein. Such devices **are also covered** by the invention herein and the term "substantially is used to cover such devices." (*Brief on Appeal*, TI-23422.1-4, 2nd paragraph.)

It is clear that Appellants intended the term “substantially saturated” to have a definition different from, and broader than, that of “completely saturates.” If Appellants had intended the terms to mean the same thing, the Appellants would have not deviated from the language found in the specification. The rejection under 35 U.S.C. 112, first paragraph, is proper.

The rejection of claims 12 to 29 under 35 U.S.C 112, second paragraph, as being indefinite.

Appellants argue that the rejection under 35 U.S.C. 112, second paragraph, for indefiniteness, is without merit. Appellants rely on MPEP 2173(b)D [sic: 2173.05(b)D] for showing that the term “substantially” is not indefinite.

In fact, this section of the MPEP states that the term “substantially” is definite or indefinite in view of the general guidelines **contained in the specification**. *In re Mattison*, 509 F.2d 563, 184 USPQ 484 (CCPA 1975) (emphasis added). As previously stated, the specification in the present appeal provides no mention of the term “substantially saturates,” much less any explanation of how it relates to the term “completely saturates.”

Appellants state that the intent of the present invention is to “totally saturate the device with hydrogen” and that by “substantially saturates” Appellants mean to include “an insignificant number of sites [that] may be unsaturated,” subject matter that would not be included if the term “completely saturates” was used. *Brief on Appeal*, TI-23422.1-4. But this “intended definition” finds no support in the specification, much less the clear and unambiguous support within a specification that is required for specially defining claim terms.

More importantly, regardless of whether Appellants' proffered definition is one reasonable possibility, it is not the only reasonable definition. *Standard Oil*, for example, provides a quite different reasonable definition of "substantially." *Standard Oil* found "substantially" to mean anything "more than an inconsequential amount." *Id.* (Or any degree more than none.) This is at the opposite end of the spectrum from Appellants' newly urged definition: in effect, "virtually all." Moreover, there are also additional possible definitions for "substantial" that exist between these two polar-opposite definitions. For example, "substantially" may mean "any large, but not whole, amount;" or "at least a predominant amount."

Without any guidelines at all appearing in the specification, one of ordinary skill in the art would not be placed on reasonable notice of what level of hydrogenation "substantially saturates" covers. Because the metes and bounds of the claims' intended coverage is so unclear, the claims are not reasonably definite. As such, the 112-2nd rejection is proper.

The rejection of claims 12-14, 20, 21-23 and 29 under 35 U.S.C. 102(b) over Ino et al. (U.S.P.No. 5,888,839)

Appellants argue that the rejection of claims 12 and 21 under 35 U.S.C. 102(b) over Ino et al. (U.S.P.No. 5,888,839) is without merit. Appellants state that Ino et al. does not diffuse hydrogen throughout and substantially saturate the device and that there is no teaching or suggestion to saturate the device with hydrogen. *Brief on Appeal*, TI-23422.1-5.

Appellants' arguments are premised on the false assumption that "substantially saturates" must be limited to be synonymous with "completely saturates." This premise is false for the reasons set forth above. And in fact, the examiner never took the position that

Ino taught **completely** saturating the device. Rather, the rejection was based upon the interpretation that "substantially saturated with hydrogen" means the device possesses "any non-inconsequential level of hydrogenation."

This interpretation was taken for two reasons. First, according to the doctrine of claim language differentiation, every word in a claim is presumed to have some meaning. As such, "saturates" must mean something different from, and be broader than, "completely saturates." Likewise, "substantially saturates" must mean something different from, and be broader than, both "saturates" and "completely saturates."

Second, patent examiners are **not** charged with the duty of applying "the *best* interpretation," "the *most likely* interpretation," nor "Appellants' alleged, subjective interpretation that *might* possibly be enforceable by the file-wrapper estoppel doctrine." Rather, it is the patent examiner's express duty to give claim language its **broadest reasonable interpretation** consistent with the specification without reading the specification's limitations into the claim, but merely using the specification as a dictionary.

In giving the claims the broadest reasonable interpretation, the Examiner found that the claims only required that the final semiconductor device contain some non-inconsequential level of diffused hydrogen. Ino et al. teaches a semiconductor with diffused hydrogen (*figure 7O, element 42; col. 10, lines 16-20*). **Appellants have never disputed whether Ino discloses all of the stated claims' limitations when "substantially saturated with hydrogen" is more broadly interpreted to mean "containing any level of hydrogenation."** Since this broader interpretation is reasonable for the reasons set forth in the rejection and also hereinabove, the rejection is proper.

Alternatively, even assuming solely for the sake of argument that "substantially saturated with hydrogen" must be afforded some hypothetical, narrower interpretation that requires a level of hydrogenation treatment that is greater than any level taught by Ino, the product-by-process doctrine dictates that the stated claims would still be anticipated.

The claims recite the method limitation of "providing a hydrogen treatment until hydrogen diffuses throughout and substantially saturates the semiconductor device." As such, the claim language does not require that the *final* device actually be saturated, or even be substantially saturated, with hydrogen. This is because, as was known by one of ordinary skill in the art, hydrogen diffuses out of silicon over time, so the level of hydrogen in the semiconductor's *final* structure will be lower than the hydrogen level immediately following the hydrogenation treatment. As such, even a device that was initially "completely saturated" with hydrogen would eventually lose hydrogen until it is less than saturated.

This well-known fact and the product-by-process rationale, were both set forth in the rejection. Appellants have not disputed this technical fact, nor the applicability of the product-by-process doctrine to the present claims. As such, the anticipation rejection over Ino is proper for this reason as well.

The rejection of claims 21-23 under 35 U.S.C. 102(b) over Mora et al. (U.S.P.No. 4,920,077)

Appellants argue that the rejection of claims 12 and 21 under 35 U.S.C. 102(b) over Mora (U.S.P.No. 4,920,077) is without merit. Appellants state that there is no teaching or suggestion that hydrogen substantially saturates the device and there is no saturation for the purpose of CHC degradation. Further, Appellants state that the material used is silane and not hydrogen. *Brief on Appeal*, TI-23422.1-6.

Appellants' argument regarding Mora teaching hydrogen "substantially" saturating the device has been addressed above under the Ino et al. rejection. Mora also teaches a semiconductor with diffused hydrogen (*col. 4, lines 48-54*).

The fact that Mora does not expressly recite why the hydrogen is incorporated into the silicon (i.e., for the Appellants' purpose of decreasing CHC degradation) is irrelevant. The claims do not require that the hydrogen occur to decrease CHC degradation. Moreover, the hydrogen diffusion of Mora would inherently decrease CHC degradation. Irrespective, arguments regarding motivations and secondary considerations are immaterial to 102 anticipation rejections.

Furthermore, the fact that Mora uses a silane (SiH_4) treatment as opposed to a pure hydrogen treatment does not distinguish the present invention *as claimed* from Mora. As Appellants admit, when silane breaks apart, it forms hydrogen and silicon. *Id.* The claims do not preclude the addition of other elements during the hydrogen treatment. As silane breaks into hydrogen and silicon, hydrogen will be diffused through the final semiconductor device.

The rejection of claim 12-14, 19-23, 28 and 29 under 35 U.S.C. 102(b) over Mora et al. (U.S.P.No. 4,920,077)

Appellants argue that the rejection of claim 12 under 35 U.S.C. 102(e) over Chen et al. (U.S.P.No. 5,866,945) is improper. Appellants state that Chen et al. teaches an Si-H bond on the HSQ dielectric layer and not on the semiconductor layer.

This difference readily acknowledged, but it is immaterial. The rejections over Chen were not premised on the *silicon semiconductor layer* being "substantially saturated" with hydrogen. The cited claims merely require (e.g., claim 12), "...hydrogen diffuses throughout

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and substantially saturates the semiconductor device.” This broad language does not require that every portion of the semiconductor device be saturated. Nor does the claim language require that every portion of the device even be *substantially* saturated. Rather, the claim is so broad as to read on a semiconductor device that has *any portion of it* “substantially saturated” with hydrogen. Appellants acknowledge that Chen’s dielectric layer includes 87% - 90% Si-H bonds. As such, the semiconductor device’s dielectric layer is “substantially saturated” with hydrogen. And therefore, the overall semiconductor device, itself, can be reasonably interpreted to be “substantially saturated” with hydrogen.

Therefore, the 35 U.S.C. 102(e) rejection over Chen et al. was proper.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner’s answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Igwe U. Anya



Conferees:

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